Lake Management Package for the Apple II+

by

Angelo Facchin

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MINISTRY OF ENVIRONMENT

BRITISH COLUMBIA FISH AND WILDLIFE BRANCH

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LAKE MANAGEMENT PACKAGE

FOR THE APPLE II

by

Angelo Facchin[1]

[1]Ministry of Environment, Fisheries Branch, 2204 Main Mall, U.B.C., Vancouver, B.C., V6T 1W5

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ABSTRACT

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Lake data from existing files on a mainframe computer was transferred to a menu driven database management system on an Apple II+ for use by Ministry of Environment regional offices. This paper describes the basic structures of the programs, structure of the data set and tables printed by the Apple lake database system.

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INTRODUCTION

The Research and Development Section of the Fisheries Branch has for many years been accumulating lake data on a mainframe database management system. Information exists for Vancouver Island, the Lower Mainland, Thompson, Kootenay, Cariboo and Okanagan regions of British Columbia.

There has been considerable interest in giving the regional offices direct access to the data. To accomplish this, a series of menu driven dBASE II programs were written and a subset of the mainframe lake data was transferred by modem to an Apple II+. The database system runs on an Apple II+ with a Z80 Card (CP/M operating system), 64K RAM, two disk drives and a printer. The printer control program is set-up for an Epson printer. dBASE II is a copyrighted database management system supported by Ashton-Tate.

Users do not require any knowledge of dBASE II in order to use the database system, but should know how to make backup copies of diskettes using the CP/M operating system. The programs are basically menu driven and, where necessary, tell the user what to do next. This paper is intended to serve as a source of information on the basic set up of the programs and the data structure rather than a step by step instruction manual.

Each Ministry regional office with data on the mainframe files will receive a set of program disks and all the data disks for the region. Anyone else who is interested in the programs should contact the author.

PROGRAM ORGANIZATION

The package consists of four or five program disks. The printer control program may or may not fit on program disks 3 and 4, depending upon which CP/M system is used. If it does not fit on program disks 3 and 4, the printer control program is provided on a separate disk.

The program disks are:

1) File management

- Select individual lakes; then view, edit, delete and/or print the selected lake record.
- Add a lake(s) to the file.
- Print a complete listing of the file, one lake per page.

All printing is done on 8 1/2 inch paper using normal print.

2) Listing program

- Generate complete planning unit lists of lakes organized by name, elevation, size, drainage, or map number.
- Also, the user can list lakes that have recently been stocked or only lakes that have been stocked in a particular year.

All printing is done on 8 1/2 inch paper using normal print.

3) Lists of lakes by selected criterion

- Lakes can be ordered alphabetically, by decreasing surface area or by increasing elevation.
- Lakes are selected for inclusion in the listings by user defined criterion from a menu consisting of the following items; surface area, elevation, access, watershed, presence or absence of inlets and outlets, species present, tds, stocked or not stocked and major constraint.
- Two lists can be generated; a list of physical parameters and a list of management and cultural information.

Printing can be done on either 14 inch paper using normal print or 8 1/2 inch paper using condensed print. The printer control program asks if condensed mode is desired; and if the user answers yes, it will set up the printer for condensed mode. If the program is on a separate disk and condensed mode is desired, run the printer control disk before running program disk 3.

4) Lists of lakes for planning purposes

- The stocking table consists of lakes with all necessary values for the standard stocking formula. Details of the calculations are presented later.
- Lakes can be ordered and selected as in disk 3, for inclusion in the planning table. The user enters estimated values necessary to generate the theoretical production estimates. Details of the calculations are presented later.

Printing can be done on either 14 inch paper using normal print or 8 1/2 inch paper using condensed print. The printer control program asks if condensed mode is desired; and if the user answers yes, it will set up the printer for condensed mode. If the program is on a separate disk and condensed mode is desired, run the printer control disk before running program disk 4.

Data disks:

Each data disk has a file of named lakes for a planning unit. You can add lakes of interest not on the file and delete lakes of no interest.

Using the system:

Remember to make a back-up of each disk and to make new backup copies of your data disks after editing the data files.

The program disks always go into DRIVE A (1) and the data disks into DRIVE B (2). Programs are all menu driven, just put the desired disks into the proper disk drives and turn the Apple on. There are explanations of what to do on the screen displays.

Never switch disks without restarting the system. Always turn off the Apple, insert the new data and/or program disks and restart the system.

Program disk 1 allows the user to edit lake records. The keys used for editing are listed below:

RETURN - enter the new value into the file and move to the next field.
CTRL-E - enter the new value into the file and move to the previous field.
CTRL-X - enter the new value into the file and move to the next field.
CTRL-S - move cursor to the left one space.
CTRL-D - move cursor to the right one space.
CTRL-W - end editing mode.

CTRL-E means to press the 'CONTROL' key and the 'E' key at the same time. RETURN, CTRL-E and CTRL-X retain the contents of a field if the user does not enter any new information.

The data disks can accept a maximum of 400 lakes. Each data disk has the data file, an alphabetic lake name index file and space for one of the other indexes that are occasionally used by the programs. When one of these indexes is required, any previously created index is destroyed and the new one generated.

There is a file on disk 1 called REDEX.CMD which will reconstruct the permanent index. The file is not part of the menu programs. If you do extensive editing, you may want to edit in dBASE and then re-index the data file.

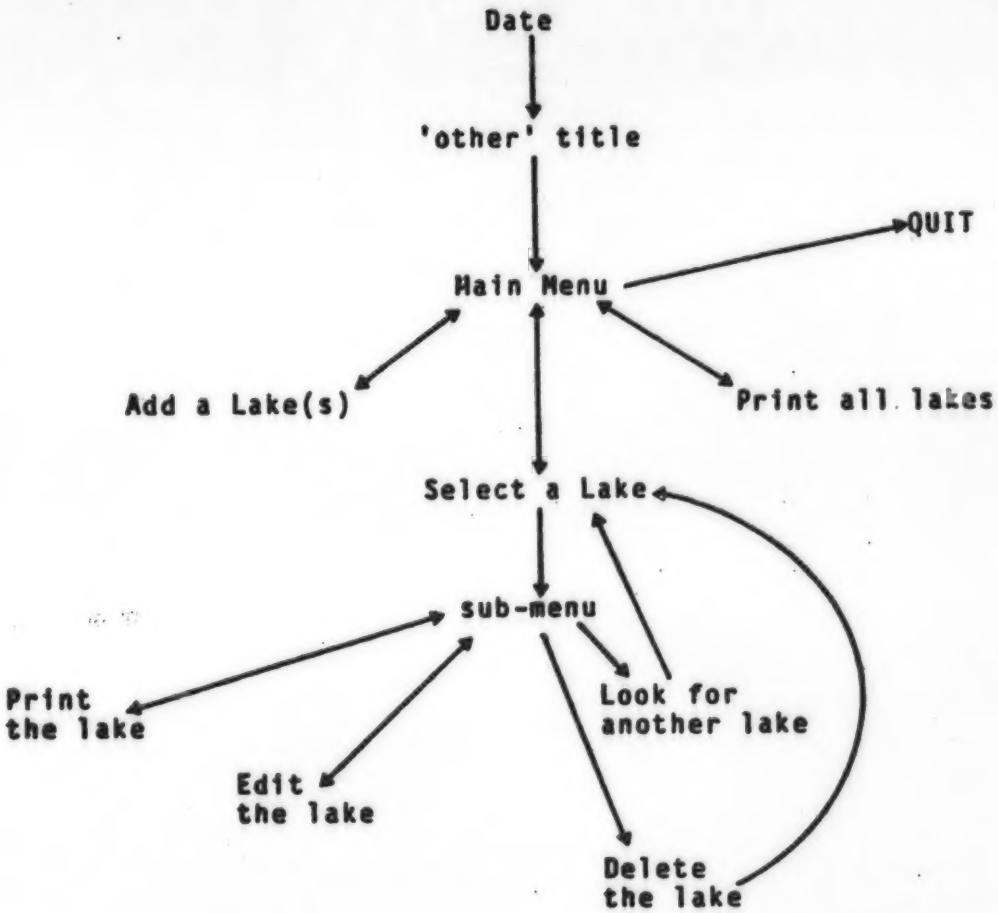


Fig. 1. Program flow for Disk 1 - File Management.

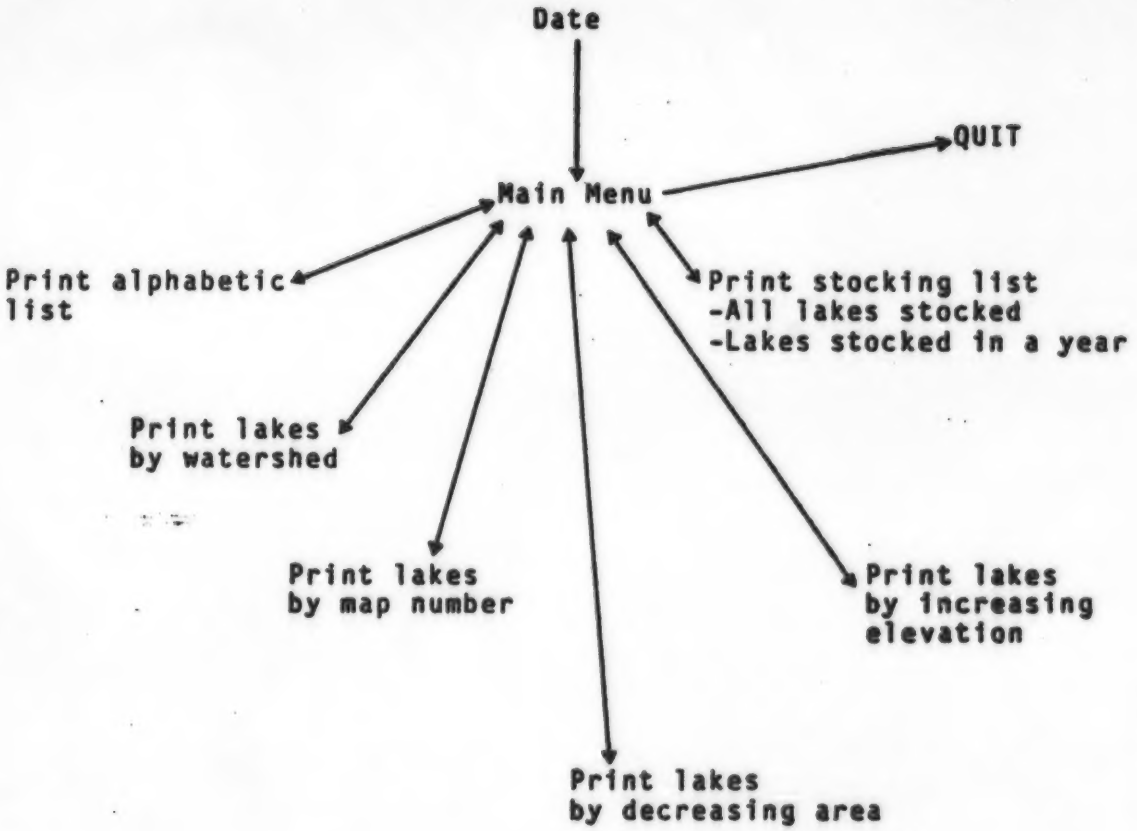
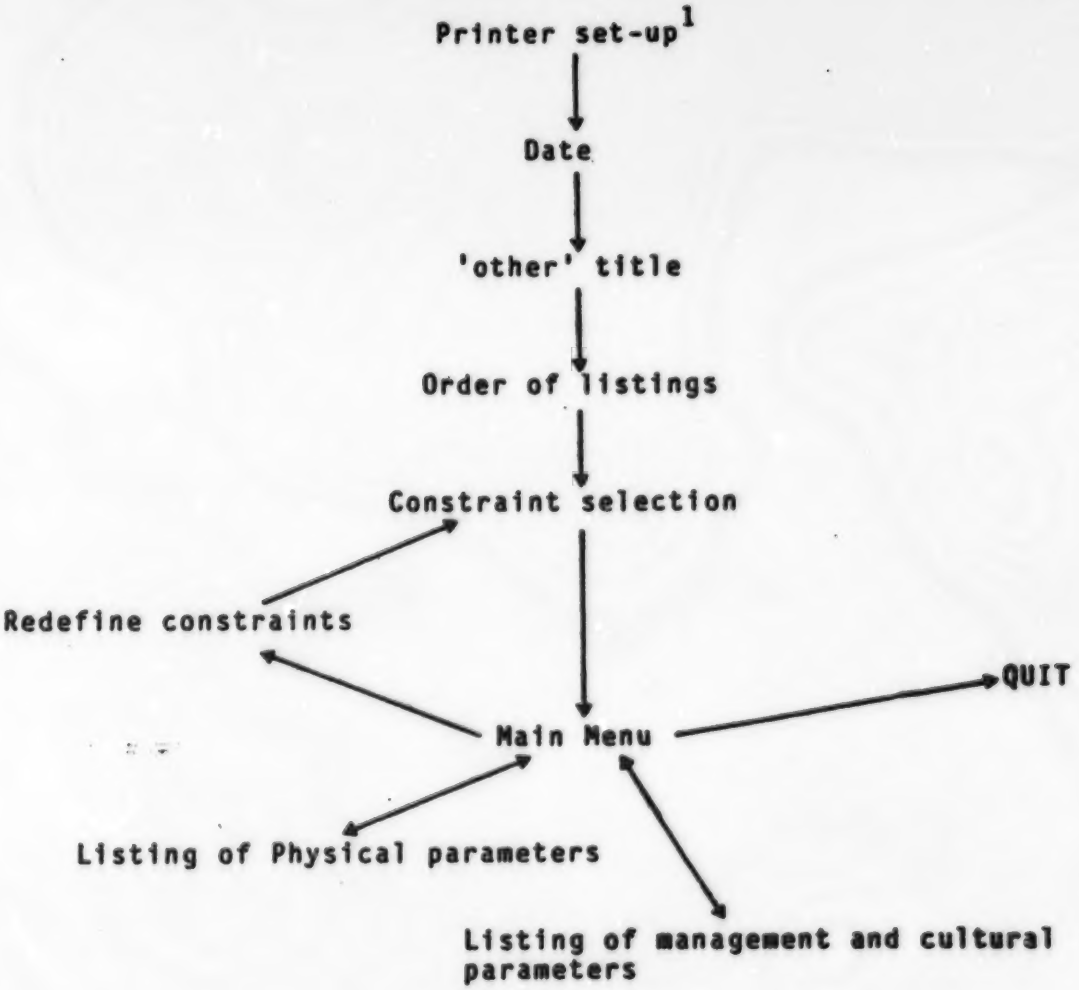
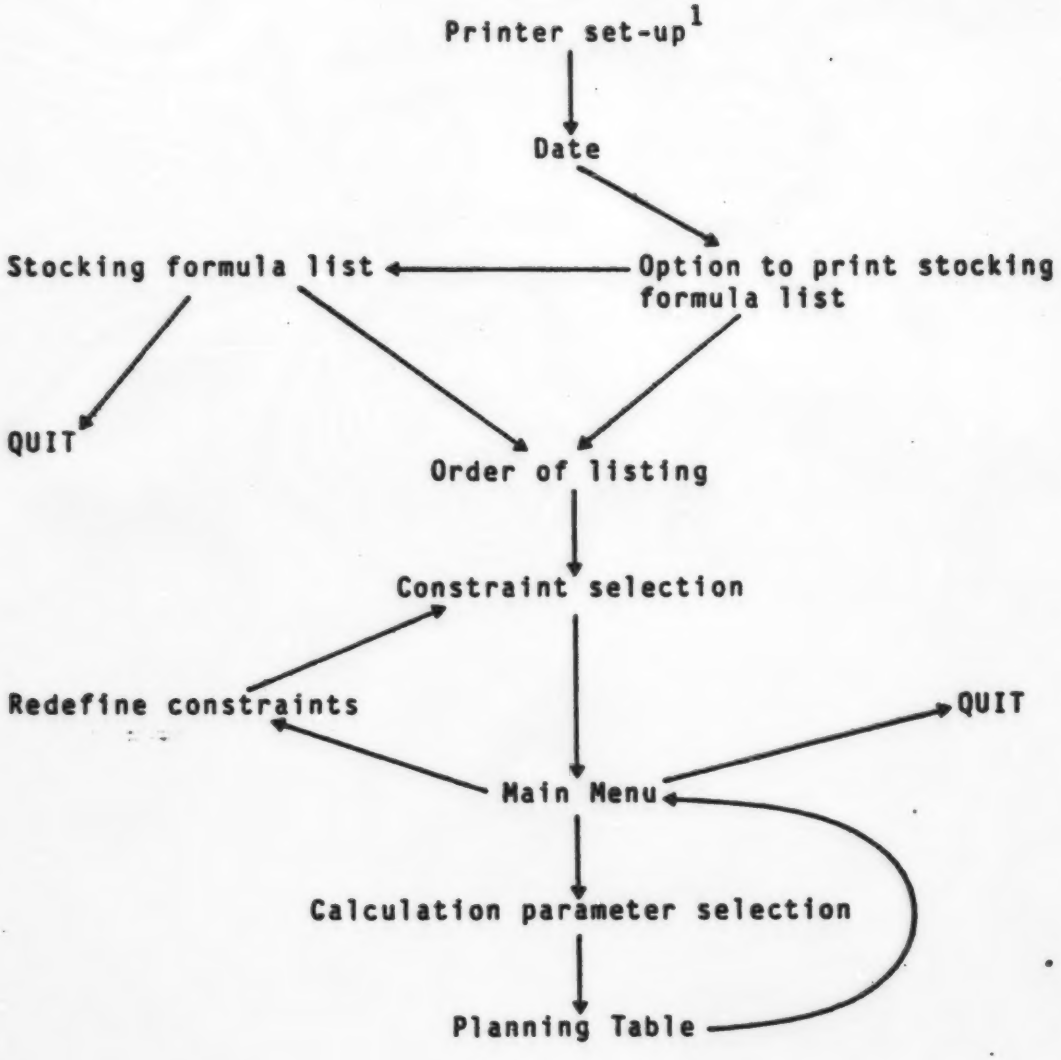


Fig. 2. Program flow for Disk 2 - Listing Programs.



[1]Printer set-up may be on a separate disk.

Fig. 3. Program flow for Disk 3 - List of Lakes by Selection Criterion.



[1]Printer set-up may be on a separate disk.

Fig. 4. Program flow for Disk 4 - Planning Programs.

Fields Used in Database

Dashes '-' and slashes '/' used in the fields are there for clarity and should be used where indicated. Right justify means to put information to your right as far as possible in the allotted space, leaving blanks to the left. Left justify is the opposite. Several character fields have numbers in them and do not automatically justify numbers, justifying the numbers properly when editing will permit the transfer of information to number fields for calculations.

1) NAME - 15 spaces for name of lake.

2) MAN:UNIT - 2 spaces for F&W management unit.

3) PLAN:UNIT - 10 spaces for region number, planning unit code and lake reference number.

Example: 1-VG-01020
where;

1 = region number
VG = planning unit code
01020 = lake reference number

The lake reference number is necessary for updating the Fisheries Research files. If you add a lake, check to see if it has a number.

Planning Unit Codes

Region	Planning Unit	Code
Vancouver Island	Victoria - Gulf Islands	1-VG
	Nanaimo - Cowichan	1-NC
	Campbell - Oyster	1-CO
	Nimpkish	1-NM
	Knight	1-KN
	West Coast	1-WC
Lower Mainland	Fraser - Delta	2-FD
	Coquitlam - Pitt River	2-CP
	Harrison - Lillooet	2-HL
	Skagit	2-SK
	Squamish	2-SQ
	Toba	2-TO
Thompson - Nicola	Nicola	3-NI
	Yalakom - Lillooet	3-YL
	Thompson - Bonaparte	3-TB
	North Thompson	3-NT
	Shuswap - Adams	3-SA

Kootenay	Elk - Flathead	4-EF
	Upper Kootenay	4-UK
	Upper Columbia	4-UC
	Columbia - Arrow	4-CA
	Kootenay - Slocan	4-KS
Cariboo	Williams Lake	5-WL
	Quesnel	5-QU
	Chilcotin	5-CH
	West Road	5-WR
	Bella Coola	5-BC
Skeena	Ootsa	6-OO
	Skeena - Nass	6-SN
	Dease - Stikine	6-DS
	Atlin - Taku	6-AT
	Queen Charlottes	6-QC
Omineca - Peace	Upper Fraser	7-UF
	Takla - Nechako	7-TN
	Peace River	7-PR
	Finlay - Omineca	7-FO
	Liard - Fort Nelson	7-LF
Okanagan	Shuswap - Mabel	8-SM
	Okanagan	8-OK
	Similkameen	8-SI
	Kettle - Granby	8-KG

4) LOCATION - 20 spaces for map number, latitude and longitude.

Example: 103P/15-48/50-123/10
93B/10-49/45-120/05

where;

103P/15 = 1:50,000 NTS map number (right justify map no. < 100)
48/50 = latitude (degrees and minutes, insert a 0 to the left for minutes < 10)
123/10 = longitude (degrees and minutes, insert a 0 to the left for minutes < 10)

5) ELEV - 4 spaces for elevation in meters.

6) DRAINAGE - 10 spaces for major drainage system.

7) ACCESS - 9 spaces for final method of access (CAR, TRUCK, 4X4, WALK BOAT, AIR) and distance, in kilometers, from paved road.

Example: 103-TRUCK
5-CAR

where;

103 = distance from paved road (right justify)
TRUCK = final method of travel (left justify)

8) SURVEY - 5 spaces for most recent survey date.

Example: 81/05
where;
81 = year
05 = month (put in a 0 to the left for months < 10)

9) AREA - 7 spaces including 1 decimal place for surface area in hectares.

10) LITTORAL - 6 spaces including 1 decimal place for shoal area in hectares.

11) PERIMETER - 7 spaces for perimeter in meters.

12) MEAN:DEP - 3 spaces for mean depth in meters.

13) MAX:DEP - 4 spaces for maximum depth in meters.

14) IN:OUT - 5 spaces for number of inlets and outlets.

Example: 125-1
5-1
where;

125 = number of inlets (right justify)

1 = number of outlets

15) TDS - 4 spaces for recent measurement of TDS in ppm.

16) PH - 4 spaces with 1 decimal place for pH.

17) OTHER - 5 spaces set aside for regional use. Region 5 has H2S measurements in this field. Any other region can put whatever is useful to that region in it, but remember to be consistent within the region.

18) SP:LIST - 26 spaces for a species list using a two letter code. You can enter up to 9 species codes.

Example: RT/CT/DV/KO/RS/SS/CO/SO/EB
RT/CT/DV/ / / / / /
where;
RT = two letter code for species

Coding for species list:

1) Fish codes:

Trout	
Rainbow	RT
Lake Trout	LT
Dolly Varden	DV
Brook Trout	BT
Brown Trout	BR
Cutthroat	CT
Steelhead	ST
Whitefish	
Round	RW
Mountain	MW
Pigmy	PW
Lake	LW
Broad	BW
Least Cisco	LC
Inconnu	IN
Grayling	
Arctic Grayling	AG
Suckers	
Coarse Scale	CS
White	WS
Longnose	LS
Bridgelip	BD
Northern Mountain	MS
Fine Scale	FS
Minnows	
Carp	CA
Goldfish	GF
Tench	TE
Redsided Shiner	RS
Squawfish	SQ
Northern Pearl Dace	PD
Peamouth Chub	PC
Northern Redbelly Dac	RD
Finescale Dace	FD
Chiselmouth	CM
Flathead Chub	FC
Lake Chub	LK
Speckled	SD
Leopard	LP
Longnose Dace	LD
Brassy Minnow	BM
Salmon	
Pinks	PK
Coho	CO
Spring	SP
Chum	CH
Sockeye	SO
Kokanee	KO

Sculpins	
Prickly	PS
Aleutian	AL
Spoonhead	SH
Torrent	TO
Slimy	SS
Columbia	CL
Bass	
Smallmouth	SB
Largemouth	LB
Pumpkinseed	PP
Black Crappie	BC
Perch	
Yellow	YP
Walleye	WA
Troutperch	
Troutperch	TP
Pike	
Northern	NP
Codfish	
Burbot	BU
Catfish	
Brown Bullhead	BB
Black Bullhead	BL
Mooneyes	
Goldeye	GO
Herring	
American Shad	AS
Smelts	
Eulachon	EU
Longfin	LF
Sticklebacks	
Three Spine	TS
Brook	BS
Lampreys	
Pacific	PL
Western Brook	WB
Western	WL
Sturgeon	
White	WH
Green	GS

2) Invertebrate codes:

Chironomids (midges)	CD	Hemiptera (boatman)	HP
Ephemerids (mayflies)	ED	Plecoptera(stoneflies)	PA
Trichoptera (caddis)	TA	Hyallela (shrimp)	HY
Oligocheata (worms)	OS	Mysis (shrimp)	MY
Zygoptera(dragonfly)	ZA	Gammarus (shrimp)	GA
Hirudinea (leeches)	HE		

19) YR:STOK - 2 spaces for the most recent year of stocking recorded.

20) SPECIES1 - 4 spaces for a 2 letter code for species stocked and a 1 letter code for type stocked. Use the same species coding as for SP:LIST.

Example: RT-Y
where;
RT = species stocked
Y = type stocked

Types are:
E = eggs
R = fry
F = fall fingerlings
Y = yearlings

21) NUMBER1 - 6 spaces for total number of SPECIES1 stocked that year.

22) SPECIES2 - 4 spaces for a second species stocked or different type of SPECIES1.

23) NUMBER2 - 6 spaces for total number of SPECIES2 stocked that year.

24) FREQ:ST - 1 space for frequency of stocking.

Example: 1
where;
1 = every year
2 = every second year

25) REHAB - 5 spaces for date of last rehab.

Example: 79/09
where;
79 = year
09 = month (put a 0 to the left for months < 10)

26) STRUCTURE - 7 spaces for a structure on the outlet, such as a coarsefish barrier, hydro dam, beaverdam, etc.

27) CONSTRAINT - 10 spaces for major constraint to fish production or harvesting and space for percent severity of the constraint.

Example: W.KILL-100
C.FISH

where;

W.KILL = code for winterkill
100 = percent chance of lake winterkilling

Codes for constraints:

W.KILL	- winterkill
S.KILL	- summerkill
C.FISH	- coarsefish
WATERS	- municipal water supply
RECREA	- heavy use by recreational activities other than fishing
D.DOWN	- drawdown problems
PRIVAT	- private access
FISH.F (F.FARM)	- fish farm
ACCESS	- access problem
MUNIC	- municipal development around the lake lake
DEPT	- Dept of Defense land
RESERV	- Indian reserve land
RESID	- residential property around the lake lake
TEMPER	- temperature problems
SLOUGH	- lake is a slough
MINE	- mine near lake
WATER	- water level problems
IRRIGA	- lake used for irrigation water
GATE	- gate on access road
L.PROD	- low productivity
BOG	- lake is a bog
W.FOWL	- water fowl reserve
ALGAE	- algae problem
MEROMI	- meromictic
RESEAR	- research lake
PERMIT	- permit required for access
SWAMPY	- lake is a swamp
SPAWN	- limited spawning
UNMANA	- unmanageable
SHALLO	- lake is very shallow
ALKALI	- lake is alkalinic
POLLUT	- lake is polluted
CORREC	- limited access because of corrections camp

28) FACILITIES - 10 spaces for 2 types of facilities on the lake, two letter code for type of facility and three spaces for the number of units. No dashes or slashes were put in this field, due to infrequent use and a need to conserve space.

Example: PC 2GS100
GS151RE 50

where;

PC = code for private cabins, first type of facility
2 = number of private cabins (right justified)
GS = code for Govt campsites, second type of facility
100 = number of govt campsites (right justified)

Codes for facilities are:

PC = private cabins
GS = govt campsites
RE = resort cabins + resort campsites
FS = forest service recreational sites

29) REGULATION - 6 spaces for special regulations.

30) COMMENTS - 20 spaces for a brief comment.

31) EFFORT - 6 spaces for estimated annual effort in angler days.

32) CPUE - 4 spaces with 1 decimal place for an estimated catch per angler day.

EXAMPLES OF TABLES GENERATED BY THE PROGRAMS

Fish and Wildlife Branch Managed Lake Inventory File 84/05/03

BEAVER F&W MU: 1 Plan Unit: 1-V6

Map Num: 92B/11 Lat: 48/30 Long: 123/23

Watershed: PORTAGE IN

Access: Final method of travel: CAR
Distance from paved road: 0 km

Elevation:	60m	Last recorded yr stocked:	80
Surface area:	38.0ha		
Littoral area:	ha	First species stocked:	RT-Y
Perimeter:	m	Number stocked:	10000
Mean Depth:	2m		
Max Depth:	m	Second species stocked:	
# of inlets:	1	Number stocked:	
# of outlets:	1		
TDS:	ppm	Stocked about every:	yrs
pH:			

Species present: SB/PP/BB/ / / / / /

Last surveyed: Structure on outlet:
Last rehabed: Major constraint: C.FISH

Facilities: Effort: angler days
Regulations: CPUE:

Comments: Other:

Fig. 5. Format used by Program Disk 1 to print complete data on individual lakes and on all lakes in a Planning Unit. The label 'Other' is for the user defined field 'OTHER'.

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84/05/03

Lake	MU	Map Num	Lat	Long	Watershed
BEAVER	1	92B/11	48/30	123/23	PORTAGE IN
BLACKBURN	1	92B/14	48/49	123/28	
BLENKINSOP	1	92B/06	48/29	123/21	
BLINKHORN	2	92B/05	48/23	123/34	
BULLOCKS	1	92B/13	48/52	123/30	TRINCOMALI
CUSHEON	1	92B/14	48/49	123/28	SWANSON CH
DURRANCE	1	92B/11	48/32	123/28	TOD INLET
ELK	1	92B/11	48/31	123/23	PORTAGE IN
FIZZLE	1	92B/11	48/30	123/29	PORTAGE IN
FLORENCE	1	92B/05	48/27	123/30	ESQUIMALT
FORD	1	92B/14	48/47	123/28	
FORK	1	92B/11	48/31	123/29	CRAIGFLOWE
GLEN	1	92B/05	48/26	123/31	ESQUIMALT
GOODACRE	1	92B/06	48/24	123/21	
GREENBURN	1	92B/11	48/44	123/12	
HEAL	1	92B/11	48/32	123/27	
HUMPBACK RES.	2	92F/05	48/27	123/33	PIPELINE
KILLARNEY	1	92B/11	48/31	123/27	
KINGSWOOD POND	1	92B/11	48/40	123/27	SAANICH IN
LANGFORD	1	92B/05	48/27	123/31	FINLAYSON
MALTBY	1	92B/06	48/29	123/27	
MATSON	1	92B/05	48/29	123/30	ESQUIMALT
MAXWELL	1	92B/13	48/49	123/32	STUART CHA
MCKENZIE	1	92B/06	48/29	123/28	PORTAGE IN
MITCHELL	1	92B/13	48/30	123/30	ESQUIMALT
PEASE	1	92B/11	48/32	123/29	FINLAYSON
PIKE	1	92B/06	48/29	123/28	PORTAGE IN
PRIOR	1	92B/06	48/28	123/27	PORTAGE IN
PROSPECT	1	92B/11	48/31	123/26	TOD INLET
QUARANTINE	2	92B/05	48/20	123/35	BECHER BAY
ROBERTS	1	92B/13	48/50	123/31	TRINCOMALT
SECOND	1	92B/11	48/31	123/30	
ST. MARY	1	92B/13	48/53	123/32	STUART CHA
STOWELL	1	92B/14	48/46	123/26	
SWAN	1	92B/06	48/27	123/22	PORTAGE IN
TEANOOK	1	92B/05	48/29	123/30	
THETIS	1	92B/06	48/28	123/28	ESQUIMALT
THIRD	1	92B/11	48/31	123/29	
WESTON	1	92B/14	48/47	123/25	
WRIGGLESWORTH	2	92B/12	48/31	123/34	SAANICH IN

Fig. 6. Format used by Program Disk 2 to print an alphabetic listing of all lakes in a Planning Unit.

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84/05/03

Lake	MU	Map Num	Lat	Long	Area (ha)
* Watershed:	PIPELINE				
HUMPBACK RES.	2	92F/05	48/27	123/33	14.0
** SUBTOTAL **					14.0
* Watershed:	PORTAGE IN				
BEAVER	1	92B/11	48/30	123/23	38.0
ELK	1	92B/11	48/31	123/23	186.0
FIZZLE	1	92B/11	48/30	123/29	5.0
MCKENZIE	1	92B/06	48/29	123/28	3.0
PIKE	1	92B/06	48/29	123/28	8.0
PRIOR	1	92B/06	48/28	123/27	1.0
SWAN	1	92B/06	48/27	123/22	5.0
** SUBTOTAL **					246.0
* Watershed:	SAANICH IN				
KINGSWOOD POND	1	92B/11	48/40	123/27	1.0
WRIGGLESWORTH	2	92B/12	48/31	123/34	4.0
** SUBTOTAL **					5.0
* Watershed:	STUART CHA				
MAXWELL	1	92B/13	48/49	123/32	28.0
ST. MARY	1	92B/13	48/53	123/32	195.0
** SUBTOTAL **					223.0
* Watershed:	SWANSON CH				
CUSHEON	1	92B/14	48/49	123/28	27.0
** SUBTOTAL **					27.0

Fig. 7. Format used by Program Disk 2 to print a complete listing of lakes in a Planning Unit organized by watershed.

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84/07/12

lake	MU	Lat	Long	Elev (m)	Watershed	Area (ha)
# Map Number:	92B/05					
QUARANTINE	2	48/20	123/35	61	BECHER BAY	2.0
BLINKHORN	2	48/23	123/34	129		2.0
GLEN	1	48/26	123/31	69	ESQUIMALT	16.0
FLORENCE	1	48/27	123/30	76	ESQUIMALT	11.0
LANGFORD	1	48/27	123/31	62	FINLAYSON	59.0
MATSON	1	48/29	123/30	107	ESQUIMALT	3.0
TEANOOK	1	48/29	123/30	91		3.0
# Map Number:	92B/06					
GOODACRE	1	48/24	123/21	23		1.0
SWAN	1	48/27	123/22	8	PORTAGE IN	5.0
PRIOR	1	48/28	123/27	38	PORTAGE IN	1.0
THETIS	1	48/28	123/28	60	ESQUIMALT	37.0
BLENKINSOP	1	48/29	123/21	23		5.0
MALTBY	1	48/29	123/27	69		9.0
MCKENZIE	1	48/29	123/28	68	PORTAGE IN	3.0
PIKE	1	48/29	123/28	53	PORTAGE IN	8.0
# Map Number:	92B/11					
BEAVER	1	48/30	123/23	60	PORTAGE IN	38.0
FIZZLE	1	48/30	123/29	183	PORTAGE IN	5.0
ELK	1	48/31	123/23	60	PORTAGE IN	186.0
PROSPECT	1	48/31	123/26	47	TOD INLET	72.0
KILLARNEY	1	48/31	123/27	122		4.0
FORK	1	48/31	123/29	230	CRAIGFLOWE	4.0
THIRD	1	48/31	123/29	206		2.0
SECOND	1	48/31	123/30	152		6.0
HEAL	1	48/32	123/27	175		3.0
DURRANCE	1	48/32	123/28	137	TOD INLET	8.0
PEASE	1	48/32	123/29	137	FINLAYSON	4.0
KINGSWOOD POND	1	48/40	123/27	30	SAANICH IN	1.0
GREENBURN	1	48/44	123/12	114		2.0

Fig. 8. Format used by Program Disk 2 to print a complete listing of lakes in a Planning Unit organized by 1:50,000 NTS map number.

PAGE NO. 00001 Victoria - Gulf Islands
84/05/03

Lake	MU	Lat	Long	Elev (m)	Area (ha)
ST. MARY	1	48/53	123/32	46	195.0
ELK	1	48/31	123/23	60	186.0
PROSPECT	1	48/31	123/26	47	72.0
LANGFORD	1	48/27	123/31	62	59.0
BEAVER	1	48/30	123/23	60	38.0
THETIS	1	48/28	123/28	60	37.0
MAXWELL	1	48/49	123/32	312	28.0
CUSHEON	1	48/49	123/28	91	27.0
WESTON	1	48/47	123/25	60	18.0
GLEN	1	48/26	123/31	69	16.0
HUMPBACK RES.	2	48/27	123/33	107	14.0
FLORENCE	1	48/27	123/30	76	11.0
BULLOCKS	1	48/52	123/30	61	10.0
MALTBY	1	48/29	123/27	69	9.0
DURRANCE	1	48/32	123/28	137	8.0
PIKE	1	48/29	123/28	53	8.0
SECOND	1	48/31	123/30	152	6.0
BLENKINSOP	1	48/29	123/21	23	5.0
FIZZLE	1	48/30	123/29	183	5.0
SWAN	1	48/27	123/22	8	5.0
FORD	1	48/47	123/28	76	4.0
FORK	1	48/31	123/29	230	4.0
KILLARNEY	1	48/31	123/27	122	4.0
PEASE	1	48/32	123/29	137	4.0
STOWELL	1	48/46	123/26	90	4.0
WRIGGLESWORTH	2	48/31	123/34	351	4.0
BLACKBURN	1	48/49	123/28	107	3.0
HEAL	1	48/32	123/27	175	3.0
MATSON	1	48/29	123/30	107	3.0
MCKENZIE	1	48/29	123/28	68	3.0
MITCHELL	1	48/30	123/30	152	3.0
ROBERTS	1	48/50	123/31	213	3.0
TEANOOK	1	48/29	123/30	91	3.0
BLINKHORN	2	48/23	123/34	129	2.0
GREENBURN	1	48/44	123/12	114	2.0
QUARANTINE	2	48/20	123/35	61	2.0
THIRD	1	48/31	123/29	206	2.0
GOODACRE	1	48/24	123/21	23	1.0
KINGSWOOD POND	1	48/40	123/27	30	1.0
PRIOR	1	48/28	123/27	38	1.0
** TOTAL **					813.0

Fig. 9. Format used by Program Disk 2 to print a complete listing of lakes in a Planning Unit ordered by decreasing surface area.

PAGE NO. 00001 Victoria - Gulf Islands
84/05/03

Lake	MU	Lat	Long	Elev (m)	Area (ha)
SWAN	1	48/27	123/22	8	5.0
BLENKINSOP	1	48/29	123/21	23	5.0
GOODACRE	1	48/24	123/21	23	1.0
KINGSWOOD POND	1	48/40	123/27	30	1.0
PRIOR	1	48/28	123/27	38	1.0
ST. MARY	1	48/53	123/32	46	195.0
PROSPECT	1	48/31	123/26	47	72.0
PIKE	1	48/29	123/28	53	8.0
BEAVER	1	48/30	123/23	60	38.0
ELK	1	48/31	123/23	60	186.0
THETIS	1	48/28	123/28	60	37.0
WESTON	1	48/47	123/25	60	18.0
BULLOCKS	1	48/52	123/30	61	10.0
QUARANTINE	2	48/20	123/35	61	2.0
LANGFORD	1	48/27	123/31	62	59.0
MCKENZIE	1	48/29	123/28	68	3.0
GLEN	1	48/26	123/31	69	16.0
MALTBY	1	48/29	123/27	69	9.0
FLORENCE	1	48/27	123/30	76	11.0
FORD	1	48/47	123/28	76	4.0
STOWELL	1	48/46	123/26	90	4.0
CUSHEON	1	48/49	123/28	91	27.0
TEANOOK	1	48/29	123/30	91	3.0
BLACKBURN	1	48/49	123/28	107	3.0
HUMPBACK RES.	2	48/27	123/33	107	14.0
MATSON	1	48/29	123/30	107	3.0
GREENBURN	1	48/44	123/12	114	2.0
KILLARNEY	1	48/31	123/27	122	4.0
BLINKHORN	2	48/23	123/34	129	2.0
DURRANCE	1	48/32	123/28	137	8.0
PEASE	1	48/32	123/29	137	4.0
MITCHELL	1	48/30	123/30	152	3.0
SECOND	1	48/31	123/30	152	6.0
HEAL	1	48/32	123/27	175	3.0
FIZZLE	1	48/30	123/29	183	5.0
THIRD	1	48/31	123/29	206	2.0
ROBERTS	1	48/50	123/31	213	3.0
FORK	1	48/31	123/29	230	4.0
MAXWELL	1	48/49	123/32	312	28.0
WRIGGLESWORTH	2	48/31	123/34	351	4.0
** TOTAL **					613.0

Fig. 10. Format used by Program Disk 2 to print a complete listing of lakes in a Planning Unit ordered by increasing elevation.

PAGE NO. 00001 Victoria - Gulf Islands 1982
84/07/16

Lake	MU	Lat	Long	SP1	Number	SP2	Number	Freq (yr)
DURRANCE	1	48/32	123/28	CT-Y	1000		0	1
ELK	1	48/31	123/23	RT-Y	17000		0	1
FLORENCE	1	48/27	123/30	CT-Y	1000		0	1
GLEN	1	48/26	123/31	RT-Y	2000		0	1
LANGFORD	1	48/27	123/31	RT-Y	2000		0	1
PRIOR	1	48/28	123/27	CT-Y	2070		0	2
PROSPECT	1	48/31	123/26	RT-Y	5000		0	1
ST. MARY	1	48/53	123/32	CT-Y	3000		0	1
STOWELL	1	48/46	123/26	CT-Y	1000		0	1
WESTON	1	48/47	123/25	RT-Y	1000		0	1

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84/07/16

Lake	MU	Lat	Long	Number	Area (ha)
* First Species Stocked: CT-Y					
DURRANCE	1	48/32	123/28	1000	8.0
FLORENCE	1	48/27	123/30	1000	11.0
PRIOR	1	48/28	123/27	2070	1.0
ST. MARY	1	48/53	123/32	3000	195.0
STOWELL	1	48/46	123/26	1000	4.0
** SUBTOTAL **				8070	219.0
* First Species Stocked: RT-Y					
ELK	1	48/31	123/23	17000	186.0
GLEN	1	48/26	123/31	2000	16.0
LANGFORD	1	48/27	123/31	2000	59.0
PROSPECT	1	48/31	123/26	5000	72.0
WESTON	1	48/47	123/25	1000	18.0
** SUBTOTAL **				27000	351.0
** TOTAL **				35070	570.0

Fig. 11. Format used by program Disk 2 to print a listing of stocked lakes. The program prints an alphabetic listing and a listing organized by species stocked.

Victoria - Gulf Islands 84/07/16

(9(access,3,3) = fc .OR. 9(access,3,3) = so)

fc = CAR so = TRUCK

Lake	Mu	Elev (m)	Area (ha)	Shoal (ha)	Perim (m)	MDep (m)	MDep (m)	TDS ppm	pH	Watershed	Inlet-Outlet	Species List	Survey Date	OTHER
BEAVER	1	60	38.0	0.0	0	2	0	0	0.0	PORTAGE IN	1-1	SB/PP/BB/ / / / / / /		
BLACKBURN	1	107	3.0	0.0	762	2	0	75	7.1		1-1	CT/ / / / / / / / /	72/09	
BULLOCKS	1	61	10.0	0.0	0	0	0	85	8.5	TRINCOMALI	1-1	RT/ / / / / / / / /	72/08	
CUSHEON	1	91	27.0	1.0	3950	4	0	65	7.2	SHAWNIGA CR	0-1	CT/TB/ / / / / / / /	72/09	
DURRANCE	1	137	8.0	0.0	1492	8	0	115	0.0	TOD INLET	0-1	CT/BB/PP/ / / / / / /	84/17	
ELK	1	60	186.0	7.0	10013	9	0	116	8.0	PORTAGE IN	2-1	RT/CT/BB/PP/PB/BB/ / /	73/09	
FLORENCE	1	76	11.0	1.0	1609	4	0	72	0.0	ESQUIMALT	3-1	CT/PP/PB/ / / / / / /	64/17	
FORD	1	76	4.0	0.0	833	2	0	122	0.0		0-0	CT/ / / / / / / / /	72/10	
FORK	1	230	4.0	0.0	905	3	0	43	0.0	CRAIGFLOWE	0-1	CT/ / / / / / / / /	61/06	
GLEN	1	69	16.0	0.0	1931	0	0	80	0.0	ESQUIMALT	-	RT/BB/PP/BB/PB/ / / /	84/18	
GOOSACRE	1	23	1.0	0.0	0	0	0	0	0.0		0-0	/ / / / / / / / /		
HUMPBACK RES.	2	107	14.0	0.0	0	0	0	0	0.0	PIPELINE	1-1	/ / / / / / / / /		
KILLARNEY	1	122	4.0	0.0	914	9	0	0	0.0		0-0	/ / / / / / / / /	59/11	
KINGSWOOD POND	1	30	1.0	0.0	180	2	0	0	4.0	SAANICH IN	1-1	/ / / / / / / / /	79/01	
LANGFORD	1	62	59.0	0.0	4426	6	0	107	0.0	FINLAYSON	1-1	RT/BB/PP/PB/ / / / /	84/19	
MALTBY	1	69	9.0	0.0	0	0	0	0	0.0		0-0	/ / / / / / / / /		
MATSON	1	107	3.0	0.0	1005	2	0	61	0.0	ESQUIMALT	1-1	CT/ / / / / / / / /	61/06	
MAXWELL	1	312	28.0	1.0	3301	3	0	67	7.1	STUART CHA	0-1	/ / / / / / / / /	72/11	
MCKENZIE	1	60	3.0	0.0	0	0	0	0	0.0	PORTAGE IN	0-1	/ / / / / / / / /		
MITCHELL	1	152	3.0	0.0	1138	2	0	54	7.2	ESQUIMALT	1-1	CT/ / / / / / / / /	72/05	
PEASE	1	137	4.0	0.0	844	3	0	61	0.0	FINLAYSON	1-1	CT/ / / / / / / / /	61/06	
PIKE	1	53	8.0	0.0	0	0	0	0	0.0	PORTAGE IN	1-1	/ / / / / / / / /		
PRIOR	1	38	1.0	0.0	0	0	0	0	0.0	PORTAGE IN	1-1	/ / / / / / / / /		
PROSPECT	1	47	72.0	3.0	4793	6	0	64	7.2	TOD INLET	1-1	BB/PP/ / / / / / / /	72/04	
SECORD	1	152	6.0	0.0	1109	3	0	59	6.8		2-0	/ / / / / / / / /	72/12	
ST. MARY	1	46	195.0	5.0	8008	7	0	110	0.0	STUART CHA	0-1	BB/CT/PB/ / / / / / /	82/04	
STONELL	1	90	4.0	0.0	805	0	0	82	0.0		0-0	CT/ / / / / / / / /		
TEAHOUSE	1	91	3.0	0.0	783	2	0	54	7.2		0-0	/ / / / / / / / /	72/08	
THETIS	1	60	37.0	3.0	6920	4	0	70	0.0	ESQUIMALT	-	BB/PP/PB/BB/ / / / /	84/	
THIRD	1	206	2.0	0.0	0	0	0	0	0.0		0-0	/ / / / / / / / /		
WESTON	1	60	18.0	0.0	2117	6	0	70	7.8		0-0	CT/RT/ / / / / / / /	72/10	
Mean		97						78	7.1		Proportion of shoal to surface area = 0.04			
Sample Size								21	11					
Total			782.0		31 Lakes									

Fig. 12. Format used by Program Disk 3 to print physical data for a user selected list of lakes from a Planning Unit. The total number of lakes in the list is used as the sample size for calculating mean elevation. The column labelled 'OTHER' is for the user defined field 'OTHER'.

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(0(access,3,3) = fc .OR. 0(access,3,3) = so)

fc = CAR so = TRUCK

Lake	MU	YR	SP1	Recmt Number	Stocking SP2	Number	Freq (yr)	Rehab Date	Struct on Outlet	Dist from Pave Road (km)	Final Method of Travel	Facilities		Major Constraint	Special Regs	Effort (amp/ days)	CPUE	Comments
BEAVER	1	00	RT-Y	10000		0	0			0	CAR			C.FISH		0	0.0	
BLACKBURN	1	0		0		0	0			0	CAR					0	0.0	
BULLOCKS	1	0		0		0	0			0	CAR	RE	1	PRIVAT		0	0.0	
CUSHEON	1	0		0		0	0			0	CAR					0	0.0	
DURRANCE	1	02	CT-Y	1000		0	1	60/11		2	CAR			C.FISH		0	0.0	
ELK	1	02	RT-Y	17000		0	1			0	CAR			C.FISH		0	0.0	
FLORENCE	1	02	CT-Y	1000		0	1	60/10		0	CAR			C.FISH		0	0.0	
FORD	1	0		0		0	0			10	CAR			PRIVAT		0	0.0	
FORK	1	0		0		0	0			5	CAR					0	0.0	
GLEN	1	02	RT-Y	2000		0	1	58/00		0	CAR			RESID		0	0.0	
GOODACRE	1	0		0		0	0			0	CAR			ROADC		0	0.0	
HUMPBACK RES.	2	0		0		0	0		DAM	0	CAR			WATERS		0	0.0	
KILLARNEY	1	0		0		0	0			6	CAR			PRIVAT		0	0.0	
KINGSWOOD POND	1	0		0		0	0			1	CAR					0	0.0	
LANGFORD	1	02	RT-Y	2000		0	1	60/00		0	CAR			RESID		0	0.0	
MALTBY	1	0		0		0	0			0	CAR					0	0.0	
MATSON	1	0		0		0	0			0	CAR			PRIVAT		0	0.0	
MAXWELL	1	0		0		0	0			6	CAR	PC	2	WATERS		0	0.0	
MCKENZIE	1	0		0		0	0			3	CAR					0	0.0	
MITCHELL	1	0		0		0	0			0	CAR	PC	2			0	0.0	
PEASE	1	0		0		0	0			5	TRUCK					0	0.0	
PIKE	1	0		0		0	0			3	CAR					0	0.0	
PRIOR	1	02	CA-Y	2070		0	2			1	CAR					0	0.0	
PROSPECT	1	02	RT-Y	5000		0	1			0	CAR			RESID		0	0.0	
SECOND	1	0		0		0	0			3	CAR	PC	1	PRIVAT		0	0.0	
ST. MARY	1	02	CT-Y	3000		0	1			0	CAR			C.FISH		0	0.0	
STOWELL	1	02	CT-Y	1000		0	1			0	CAR					0	0.0	
TEAHOOK	1	0		0		0	0			0	CAR	PC	2	PRIVAT		0	0.0	
THETIS	1	01	RT-Y	3000		0	1			0	CAR			C.FISH		0	0.0	
THIRD	1	0		0		0	0			4	CAR					0	0.0	
WESTON	1	02	RT-Y	1000		0	1			0	CAR					0	0.0	
Totals																		
31 Lakes				48070		0										0		
																	0.0(	0 Rows

Facilities: PC = Private Cabins, GE = Govt Campsites, RE = Resort Cabins and Campsites, FS = Forest Service Sites

Fig. 13. Format used by Program Disk 3 to print management and cultural data for a user selected list of lakes from a Planning Unit.

Standard Stocking Formula Calculation

The following calculations are used in the stocking formula table produced by program disk 4 and illustrated in Fig. 14.

FRY = (TDS + 100) * ((24.7 * SHOAL AREA) + (2.47 * SURFACE AREA))

FALL FINGERLINGS = FRY / 2

YEARLINGS = FRY / 10

Areas are in hectares and only lakes with recorded TDS, shoal area and surface area are used. Calculations are from the methods used by Stringer et al. (1980).

The ACTUAL/ESTIMATED column in Fig. 14 is the actual number of SPECIES1 stocked divided by the appropriate type (fry, fall fingerling, yearling) of estimated numbers to stock. This number will give an indication of how heavy a lake is being stocked.

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FRY = (TDS + 100) * ((24.7 * SHOAL AREA) + (2.47 * AREA))Area in ha, fall-fing = fry/2, yearlings = fry/10

Lake	MU	TDS (ppm)	Area (ha)	Shoal (ha)	YR SP1	Number SP2	Number	Freq (yr)	Stocking formula estimates Fry	Fall-fing	Yearlings	SP1 Type	Actual / Estimated
CUSHEON	1	65	27.0	1.0	0	0	0	0	13079	7540	1508		0.00
ELK	1	116	186.0	7.0	82 RT-Y	17000	0	1	136581	68291	13658	Y	1.24
FLORENCE	1	72	11.0	1.0	82 CT-Y	1000	0	1	8922	4461	892	Y	1.12
MAXWELL	1	67	28.0	1.0	0	0	0	0	13675	7838	1568		0.00
PROSPECT	1	64	72.0	3.0	82 RT-Y	5000	0	1	41318	20659	4132	Y	1.21
ST. MARY	1	110	195.0	5.0	82 CT-Y	3000	0	1	127982	63541	12708	Y	0.23
THETIS	1	70	37.0	3.0	81 RT-Y	3000	0	1	28133	14067	2813	Y	1.06

Fig. 14. Format used by Program Disk 4 to print stocking information for lakes with recorded TDS, surface area and shoal area.

Planning Exercise Calculations

The following calculations are used in the planning table produced by program disk 4 and illustrated in Fig. 15.

Catch (number of fish)

A mean CPUE can be entered and will be used in the following calculation where a CPUE has not been recorded in the file.

CATCH = EFFORT * CPUE

An estimate of effort must be recorded in the file in order to generate a catch.

Yearling Capacity (number of fish)

YEARLING CAP = TDS *((2.47 * SHOAL AREA) + (.247 * SURFACE AREA))

The model works on the assumption that there is one age class in the lake. A mean TDS can be entered as a substitute for missing TDS measurements. Where shoal area is not recorded, a number between 0.00 and 1.00 can be entered to estimate shoal area from surface area using the following calculation.

SHOAL AREA = SURFACE AREA * PROPORTION THAT IS SHOAL AREA
(where shoal area is not recorded)

Production Estimate (Kg/Yr)

Yearling capacity is then converted to an estimate of yearly production in Kg/Yr.

PRODUCTION = YEARLING CAP * SURVIVAL * GROWTH INCREMENT

This equation uses an estimated optimum survival and growth from yearlings to two year old catchables. The Default values are:

SURVIVAL = 0.60
GROWTH INCREMENT = 0.34 KG (.75 LBS)

These values can be changed by the user.

Yearling capacity and production estimate calculations are from unpublished work done by Dr. A. F. Tautz.

Number of Fish (Number of Catchable Size Fish)

The program calculates the number of catchable size fish assuming there is only one year class in the lake. A value is entered for the mean weight of catchable fish into the following equation.

CATCHABLE SIZE FISH = PRODUCTION / MEAN WEIGHT OF CATCHABLE FISH

The actual size of fish in a lake may not be the same as the optimum growth increment used in the calculation of yearly production. Yearling weight is considered to be negligible compared to the weight gain between yearling size and two year old catchable size.

Harvestable Surplus

The program will calculate the number of fish harvestable if a value is entered for proportion harvestable on a sustained basis. The number entered must be between 0.00 and 1.00 and is used in the following equation:

HARVESTABLE SURPLUS = CATCHABLE SIZE FISH * PROPOR HARVESTABLE

Surplus - Catch

The program performs the following calculation to indicate if the lake is being over (minus number) or under (positive number) harvested.

SURPLUS = HARVESTABLE SURPLUS - CATCH

Using the Program

If you do not want to generate any of the calculations, Do not enter values when prompted. However, the theoretical production estimate will be calculated for lakes with complete data.

The user can select a specific type of lake (low elevation, small lakes or high elevation small lakes) within a planning unit and enter appropriate values for the calculations. Then select another lake type and enter appropriate values for the calculations on that type of lake. Lake size may make a major difference in the proportion used to convert surface area to estimated shoal area.

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(Staccess,5,5) = fc .OR. Staccess,5,5) = sc)

fc = CAR sc = TRUCK

Lake	MU	Elev (m)	Area (ha)	Shoal (ha)	TDS ppm	SPI	Stocking Number	Effort ang/dy	CPUE	Catch (fish)	Yearling Capacity	Prod Est. (kg/yr)	Number of fish	Harvest Surplus	Surplus-Catch
BEAVER	1	60	38.0	0.0	0	RT-Y	10000	0	0.0	0	1090	224	747	224	224
BLACKBURN	1	107	3.0	0.0	75		0	0	0.0	0	85	17	57	17	17
BULLOCKS	1	61	10.0	0.0	85		0	0	0.0	0	315	64	213	63	63
CHEMAINUS	1	91	27.0	1.0	65		0	0	0.0	0	594	121	403	120	120
DERRANCE	1	137	8.0	0.0	115	CT-Y	1000	0	0.0	0	341	70	233	69	69
ELK	1	60	186.0	7.0	116	RT-Y	17000	0	0.0	0	7333	1496	4987	1496	1496
FLORENCE	1	76	11.0	1.0	72	CT-Y	1000	0	0.0	0	373	76	253	75	75
FORD	1	76	4.0	0.0	122		0	0	0.0	0	181	37	123	36	36
FORK	1	230	4.0	0.0	43		0	0	0.0	0	64	13	43	12	12
GLEN	1	69	16.0	0.0	89	RT-Y	2000	0	0.0	0	474	97	323	96	96
GOODACRE	1	23	1.0	0.0	0		0	0	0.0	0	29	6	20	6	6
HAYPOCK RES.	2	107	14.0	0.0	0		0	0	0.0	0	405	83	277	83	83
KILLARNEY	1	122	4.0	0.0	0		0	0	0.0	0	116	24	80	24	24
KINGSWOOD POND	1	30	1.0	0.0	0		0	0	0.0	0	29	6	20	6	6
LANGFORD	1	62	59.0	0.0	107	RT-Y	2000	0	0.0	0	2339	477	1590	477	477
MALTBY	1	69	9.0	0.0	0		0	0	0.0	0	260	53	177	53	53
MATHEW	1	107	3.0	0.0	61		0	0	0.0	0	68	14	47	14	14
MAXWELL	1	312	28.0	1.0	67		0	0	0.0	0	629	128	427	128	128
MCKENZIE	1	68	3.0	0.0	0		0	0	0.0	0	87	18	60	18	18
MITCHELL	1	152	3.0	0.0	54		0	0	0.0	0	60	12	40	12	12
PEARL	1	137	4.0	0.0	61		0	0	0.0	0	90	18	60	18	18
PIKE	1	53	8.0	0.0	0		0	0	0.0	0	231	47	157	47	47
PRIOR	1	38	1.0	0.0	0	CT-Y	2070	0	0.0	0	29	6	20	6	6
PROSPECT	1	47	72.0	3.0	64	RT-Y	5000	0	0.0	0	1612	329	1097	329	329
SECORD	1	122	6.0	0.0	57		0	0	0.0	0	131	27	90	27	27
ST. MARY	1	46	195.0	5.0	110	CT-Y	3000	0	0.0	0	4457	1358	4527	1358	1358
STONELL	1	90	4.0	0.0	82	CT-Y	1000	0	0.0	0	122	25	83	24	24
TEANNER	1	91	3.0	0.0	54		0	0	0.0	0	60	12	40	12	12
THETIS	1	60	37.0	3.0	70	RT-Y	3000	0	0.0	0	1158	236	787	236	236
TRIAD	1	206	2.0	0.0	0		0	0	0.0	0	58	12	40	12	12
WESTON	1	60	18.0	0.0	70	RT-Y	1000	0	0.0	0	467	95	317	95	95
Means		97			78				0.0	Actual proportion of shoal to surface area = 0.04					
Sample Size					21				0						
Totals															
31 Lakes			782.0				48070			0		5201		5201	
					12 Lks stocked			0			25493		17338		5201

Estimated values used to replace missing values in equations:
Mean CPUE = 1.6 Mean TDS = 78 Mean proportion of shoal = 0.05 Mean SURVIVAL = 0.60
Mean GROWTH INCREMENT = 0.34 Mean size of catchable fish = 0.30 Mean proportion harvestable = 0.30

Fig. 15. Format used by Program Disk 4 to print planning information for user selected lakes in a Planning Unit. The total number of lakes in the listing is used to calculate the mean elevation.

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